SECTION 16145
LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the contract, including General and Supplementary Conditions apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Time switches.
   2. Photoelectric relays.
   3. Occupancy sensors.
   4. Multipole contactors and relays.

B. Related Sections: The following sections contain requirements that relate to this Section:
   1. Section 16050, Basic Materials and Methods.
   2. Section 16120, Building Wire & Cable 600V and Below.
   3. Section 16131, Boxes.
   4. Section 16196, Electrical Identification.

1.3 REFERENCES

A. National Fire Protection Association (NFPA):
   1. NFPA 70, 1999, National Electrical Code, (NEC).

B. Federal Regulations:
   1. 47CFR15, Telecommunications Systems.

C. American National Standards Institute (ANSI):
   1. ANSI C62.41, 1991, Recommended Practice on Surge Voltages in Low Voltage AC Power Circuits.

D. Underwriters laboratories, Inc. (UL) :
   1. UL 1449, 1996, Transient Voltage Surge Suppressors.
   2. UL 773A, 1995, Plug-In Locking Type Photo Controls for use with Area Lighting.
   3. UL 508, 1993, Industrial Control Equipment.
   4. UL 486A, 1997, Wire Connectors and Soldering Lugs for use with Copper Conductors.

1.4 SUBMITTALS

A. Product Data: Include dimensions and data on features, components, and ratings for lighting control devices.

B. Samples: Occupancy sensors for color selection and evaluation of technical features.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

D. Maintenance Data: Include maintenance manuals specified in General and Supplementary Conditions for lighting control devices.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain lighting control devices from a single source with total responsibility for compatibility of lighting control system components specified in this Section.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for their indicated use and installation conditions by a testing agency acceptable to authorities having jurisdiction.

C. Comply with 47 CFR 15, Subparts A and B, for Class A digital devices.

D. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate features of devices specified in this Section with systems and components specified in other Sections to form an integrated system of compatible components. Match components and interconnections for optimum performance of specified functions.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment to the jobsite in factory containers with protective crating and covering.

B. Store and handle equipment to prevent damage.

1.8 SEQUENCING AND SCHEDULING

A. Schedule installation of equipment in the sequence of construction to prevent damage to installation from follow-on construction activities.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Contactors and Relays:
      a. Automatic Switch Co.
      b. Cutler-Hammer Products; Eaton Corporation.
      c. GE Lighting Controls.
      d. Square D Co.; Power Management Organization.
   2. Time Switches:
      a. Intermatic, Inc.
      b. Leviton Manufacturing.
      c. Paragon Electric Co., Inc.
      d. Tork, Inc.
   3. Photoelectric Relays:
      a. Allen-Bradley/Rockwell Automation.
      b. Area Lighting Research, Inc.
      c. Intermatic, Inc.
      d. Paragon Electric Co., Inc.
      e. SSAC, Inc.

f. Tork, Inc.

4. Occupancy Sensors:
   a. Honeywell, Inc.; Home and Building Controls.
   b. Hubbell Lighting, Inc.
   c. Novitas, Inc.
   d. Tork, Inc.
   e. Touchplate.
   f. Watt Stopper, Inc. (The).

2.2 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

A. Line-Voltage Surge Protection: Include in all 120- and 277-V solid-state equipment. Comply with UL 1449 and with ANSI C62.41 for Category A locations.

2.3 TIME SWITCHES

A. Description: Solid-state programmable units with alphanumeric display complying with UL 917.

B. Description: Electromechanical-dial type complying with UL 917.
   1. Astronomic dial.
   2. Two contacts, rated 30 A at 277-V ac, unless otherwise indicated.
   3. Two pilot-duty contacts, rated 2 A at 240-V ac, unless otherwise indicated.
   4. Eight-day program uniquely programmable for each weekday and holidays.
   5. Skip-day mode.

2.4 PHOTOELECTRIC RELAYS

A. Description: Solid state, with single-pole, double-throw dry contacts rated to operate connected relay or contactor coils or microprocessor input, and complying with UL 773A.

B. Light-Level Monitoring Range: 0 to 50 fc, with an adjustment for turn-on/turn-off levels.

C. Time Delay: Prevents false operation.

D. Indoor Ceiling- or Wall-Mounting Units: Adjustable for turn-on/turn-off levels, semiflush, calibrated to detect adequacy of daylighting in perimeter locations, and arranged to turn artificial illumination on and off to suit varying intensities of available daylighting (10-200 fc).

E. Indoor Skylight Units: Housed in a threaded plastic fitting for mounting under skylight (1,000 to 10,000 fc).

F. Outdoor Sealed Units: Weathertight housing, twist lock electrical connection, resistant to high temperatures and equipped with sun-glare shield and ice preventer (1.5-10 fc).

2.5 OCCUPANCY SENSORS

A. Ceiling-Mounting Units: Unit receives control power from a separately mounted auxiliary power and control unit, and operates power switching contacts in that unit.

B. Ceiling-Mounting Units: Unit receives 24-V dc power from a remote source and, on sensing occupancy, closes contacts that provide signal input to a remote microprocessor-based lighting control system.

C. Switch-Box-Mounting Units: Unit receives power directly from switch leg of the 120- or 277-V ac circuit it controls and operates integral power switching contacts rated 800 W at 120-V ac, and 1,000 W at 277-V ac, minimum.

D. Operation: Turns lights on when room or covered area is occupied and off when unoccupied, unless otherwise indicated.
1. Time Delay for Turning Lights Off: Adjustable over a range from 1 to 15 minutes, minimum.
2. Manual Override Switch: Turns lights off manually regardless of elapsed time delay.
3. Ambient-Light-Level Control: Adjustable for setting a level of ambient illumination above which sensor will not turn lights on when occupancy is sensed.
4. Isolated Relay Contact: Operates on detection of occupancy or vacancy, as indicated, to activate an independent function.

E. Auxiliary Power and Control Units: As follows:
1. Relays rated for a minimum of 20-A normal ballast load or 13-A tungsten filament or high-inrush ballast load.
2. Sensor Power Supply: Rated to supply the number of connected sensors.

F. Passive-Infrared Type: Detects occupancy by a combination of heat and movement in zone of coverage. Each sensor detects occupancy anywhere in an area of 1,000 sq. ft. (93 sq. m) by detecting occurrence of 6-inch (150-mm) minimum movement of any portion of a human body that presents a minimum target of 36 sq. in. (232 sq. cm) to the sensor.

G. Ultrasonic Type: Emits a beam of ultrasonic energy and detects occupancy through use of Doppler's principle in discerning movement in zone of coverage by sensing a change in pattern of reflected ultrasonic energy.

H. Dual-Technology Type: Uses a combination of passive-infrared and ultrasonic detection methods to distinguish between occupied and unoccupied conditions for area covered. Particular technology or combination of technologies that controls each function (on or off) is selectable in the field by operating controls on unit.

2.6 MULTIPOLE CONTACTORS AND RELAYS

A. Description: Electrically operated and electrically held, and complying with UL 508 and NEMA ICS 2.
1. Current Rating for Switching: UL listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballasts with 15 percent or less total harmonic distortion of normal load current).
2. Control Coil Voltage: Match control power source.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine electrical rough-in for installation of devices. Verify that construction is satisfactory for proper installation of devices.

B. Examine walls, floors, and ceilings for suitable conditions where devices are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install equipment level and plumb and according to manufacturer's written instructions.

B. Mount lighting control devices according to manufacturer's written instructions and requirements in Division 16, Section 16050, Basic Materials and Methods.

C. Mounting heights indicated are to bottom of unit for suspended devices and to center of unit for wall-mounting devices.

3.3 CONTROL WIRING INSTALLATION

A. Install wiring between sensing and control devices according to manufacturer's written instructions.

B. Wiring Method: Install all wiring in raceway as specified in Division 16, Section 16111, Conduit and Fittings, unless run in accessible ceiling space and gypsum board partitions in accordance with NFPA 70 requirements.

C. Bundle, train, and support wiring in enclosures.

D. Ground equipment as required by NFPA 70.

E. Connections: Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.4 IDENTIFICATION

A. Identify components, power, and control wiring according to Division 16, Section 16050, Basic Materials and Methods and Section 16196, Electrical Identification.

3.5 FIELD QUALITY CONTROL

A. Schedule visual and mechanical inspections and electrical tests with at least seven days' advance notice.

B. Inspect control components for defects and physical damage, testing laboratory labeling, and nameplate compliance with the Contract Documents.

C. Check tightness of electrical connections with torque wrench calibrated within previous six months. Use manufacturer's recommended torque values.

D. Verify settings of photoelectric devices with photometer calibrated within previous six months.

E. Electrical Tests: Use particular caution when testing devices containing solid-state components. Perform the following according to manufacturer's written instructions:
   1. Continuity tests of circuits.
   2. Operational Tests: Set and operate devices to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions.
      a. Include testing of devices under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.

F. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.

G. Operational Tests: Perform tests to verify correct operation of all devices including illumination, movement, seat occupant, etc. to verify correct operation, both automatic and manual of all devices. Provide for approval to the Construction Manager a comprehensive test plan to be used for all tests. Plan shall include record data sheets, forms and check-off sheets.

H. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.

I. Reports: Submit to Construction Manager for approval all written reports of tests and observations. Record defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.

3.6 CLEANING

A. Cleaning: Clean equipment and devices internally and externally using methods and materials recommended by manufacturers, and repair damaged finishes.

3.7 PROTECTION

A. Protect installed devices from damage from continuing construction activities until project completion.

3.8 DEMONSTRATION

A. Provide training for low-voltage lighting control devices and programmable lighting control systems as recommended by the manufacturer.

B. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:
1. Train Owner's maintenance personnel on troubleshooting, servicing, adjusting, and preventive maintenance. Provide a minimum of three hours' training.
2. Training Aid: Use the approved final version of maintenance manuals as a training aid.
3. Schedule training with Construction Manager with at least seven days of advanced notice.

3.9 ON-SITE ASSISTANCE

A. Occupancy Adjustments: Within one year of date of Substantial Completion, provide up to three Project site visits, when requested, to adjust light levels, make program changes, and adjust sensors and controls to suit actual conditions.

END OF SECTION 16145